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September 28, 2000

Mr. Dick Arkills, P.E.
Director, Hydro Operations and
Power Supply
Pend Oreille PUD
Box Canyon Dam
P.O. Box 547
Ione, WA 99139

Subject: **Sullivan Creek Project**
Underwater Inspection of Mill Pond Dam Plunge Pool and Toe

Dear Dick:

On September 8, 2000, Allied Commercial Divers performed an underwater inspection of the plunge pool and toe of Mill Pond Dam. The inspection was performed to look for evidence of structural instability and adverse conditions at the toe of the dam. Probably the last time the toe was inspected was in 1973 when repairs to the downstream face were made, but there are no records of any previous inspections. According to the third safety review performed in 1978, the downstream side of the dam was faced with reinforced concrete and additional concrete was placed at the toe of the dam.

The September 2000 inspection found the dam to be in remarkably good condition. The diver noted a missing rock below the toe, but no unstable or adverse conditions. However, the diver's inspection revealed some new information about the dam—the base is massive concrete at the toe, the foundation is lower than indicated on the drawings, and there is an abandoned gate slot in the central portion of the dam. Further evidence that the toe of the dam is embedded or keyed into the rock was also revealed.

The purpose of this letter is to document the inspection and record the observations of the diver. The diver took photos during the inspection, and later prepared sketches, which show the location of the photos and the features he saw. The diver's sketches (Sketch 1 and 2), photos, and photo log are attached at the end of this letter. The diver also reported his observations verbally immediately after his inspection. Following is a summary of the inspection.

You and I met Dave Darlow, David Darlow (father and son) and Dean Shockley of Allied Commercial Divers at Mill Pond Dam at 10:30 a.m. The weather was cool and breezy with high clouds, but it began to rain before we left the dam. The depth of water at the spillway crest was about 12 inches. Tailwater was about 5 ft below the sill of the toe. Spill plunged about 6 ft downstream from the toe, which allowed the diver to inspect the dam under the nappe.

Spill at toe of Mill Pond Dam

At the toe on the left side, spill struck a large rock outcrop that extends above the sill of the toe. On the right side, the training wall diverted spill away from the rock bank.

Prior to the inspection, we looked at the drawing of the dam and instructed the diver to inspect for erosion and undermining. The diver's gear was lowered, and we climbed down the slope on the right side of the dam to the bank about 25 feet downstream from the toe. David Darlow was the diver. He began the underwater inspection at 11:25 a.m. and completed the inspection at 11:45 a.m.

The only evidence of erosion the diver saw was a 3ft high by 4 ft wide by 2 ft deep hole in the rock face on the left side, well below the water surface. The location and details of the hole are shown on Sketch 1 and 2. The hole may have been left by a dislodged rock but the diver noted the missing rock was not evident. The diver reported there was no evidence that the hole developed recently or is currently being scoured. The condition of the rock face does not

endanger the dam and therefore no corrective measures or repairs are deemed necessary to prevent further erosion.

Timbers used for cribbing and formwork during historic repairs are intact at the toe of the concrete. In-place timber forms were also seen in a hole in the rock on the right side above the water (see Photo 9). These timber forms apparently were used to seal a void for concrete placement on the upstream side of the rock. Photo 8 shows an apparent horizontal joint in the concrete right above the water line. The location of this joint appears to closely coincide with the base of the dam shown on the original cross section drawing of Mill Pond Dam (Section B-B, Figure 7 of the 2000 Safety Review).

The diver noted the outline of a 6-ft-square abandoned gate slot. The outlet was filled with concrete. The diver reportedly saw in-place remnants of the timber formwork that was used to cover the opening. No records of a low-level outlet in the dam are known to exist. However, the plan drawing of the dam shows the operating deck wider to the upstream side at the center of the dam, and a wheel-like object on the widen portion of the deck. The widen deck suggests a gate operator. The original deck outline of Mill Pond Dam was nearly identical to Sullivan Lake Dam. Sullivan Lake Dam, built about the same time as Mill Pond Dam, is equipped with low-level outlets, which are controlled by gate operators installed on the deck.

The diver observed a trough in the massive rock on the left side of the toe (see Sketch 1). The diver reported that the trough appeared to have been excavated, and was not natural looking. It is possible that this trough was used for diverting water during construction. The diver also observed and noted concrete on the bottom of the plunge pool on the right side. A wheelbarrow was found embedded in the concrete.

Several conclusions can be drawn from the inspection. The foundation of the dam is about 10 feet lower than indicated on the drawings and the original dam had a low-level outlet, which was subsequently filled with concrete. The foundation of the dam is in good condition and no repairs or modifications are needed. The dam is embedded into the rock on the abutments.

The plunge pool, estimated to be at least 20 ft deep, provides good dissipation of energy from spill. The presence of the timber formwork and wheelbarrow, nature of undisturbed rocks on the bottom of the plunge pool, and massive rock at the abutments and foundation, all suggest that scour and erosion at the toe is not a problem. Another underwater inspection of the plunge pool would not be warranted unless a large spill of at least 5,000 cfs occurs.

The inspection provided further evidence that the dam is embedded or wedged into the rock. The plan drawing shows the length of the dam is 34 ft at the toe. The inspection revealed the length between the rock abutments at the water line is about 20 ft. The massive rock on the left side extends about 10-12 ft toward the center, and the rock on the right about 3-5 ft.

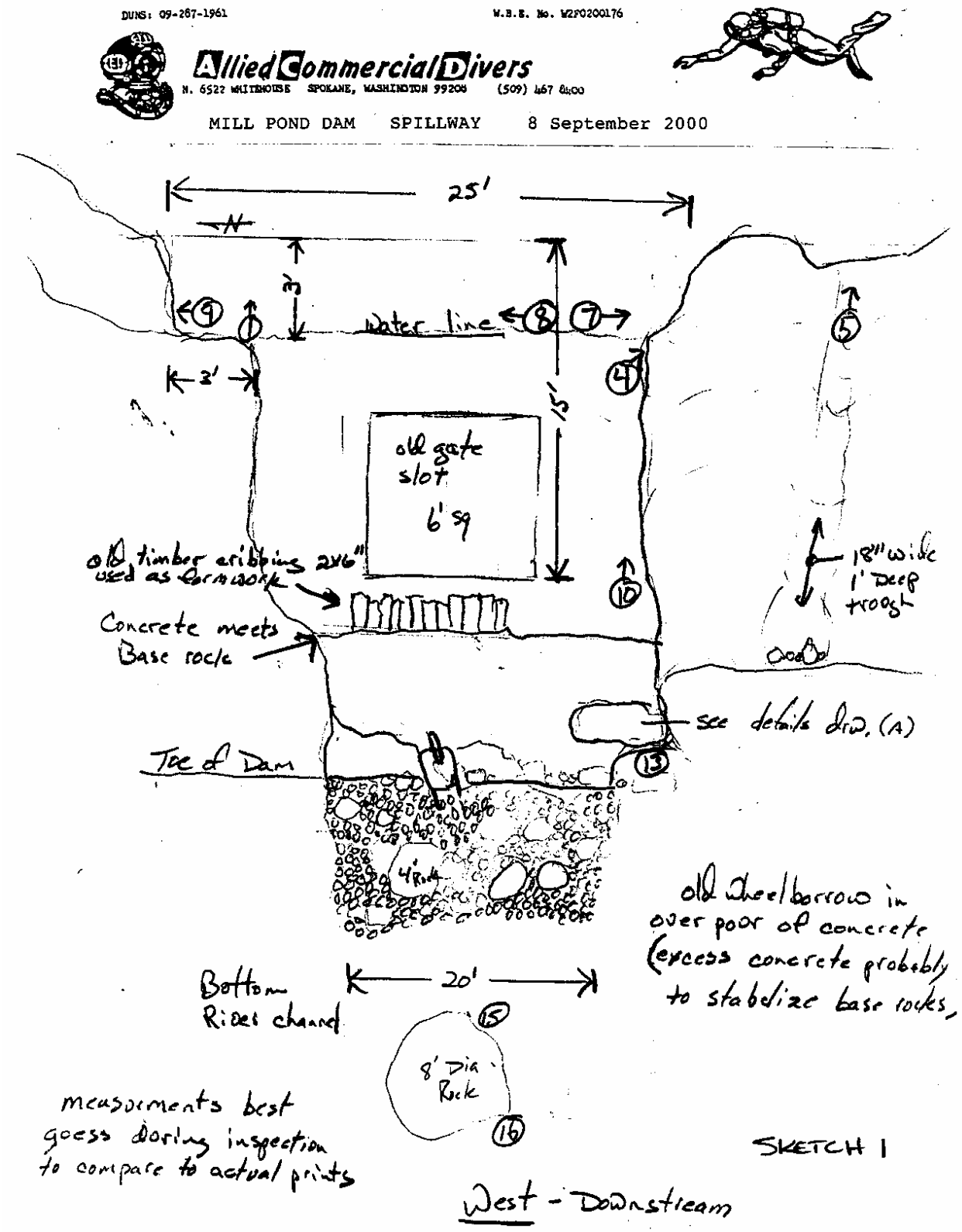
The current stability evaluation considers the base elevation of the dam to be at or very close to the horizontal joint just above the water line shown in Photo 9. The massive block of concrete below that level appears to be keyed well into the rock. The passive resistance available to the dam due to embedment into the rock foundation is believed to be significant based on typical shear strength properties of the rock (phyllite). This passive resistance contributes to the sliding resistance and significantly increases the shear-friction safety factor for Mill Pond Dam.

Please let me know if you have any questions. Thanks.

Sincerely,
DUKE ENGINEERING & SERVICES

Scott E. Mahnken, PE
Civil Engineering Consultant

cc: Mark Cauchy
J. Snyder
File 2.2.1


DUNS: 09-267-1961
W.B.E. No. W2F0200176
Allied Commercial Divers
N. 6522 WHITEHOUSE SPOKANE, WASHINGTON 99208 (509) 467 8400
MILL POND DAM SPILLWAY 8 September 2000
25'
N
3'
water line
3'
15'
old gate slot
6' sq
old timber cribbing 2x6" used as formwork
Concrete meets Base rock
18" wide 1' Deep trough
see details drw. (A)
Toe of Dam
4' Rock
old wheelborrow in over pour of concrete (excess concrete probably to stabilize base rocks,
Bottom River channel
20'
8' Dia Rock
measurements best guess during inspection to compare to actual prints
SKETCH 1
West - Downstream

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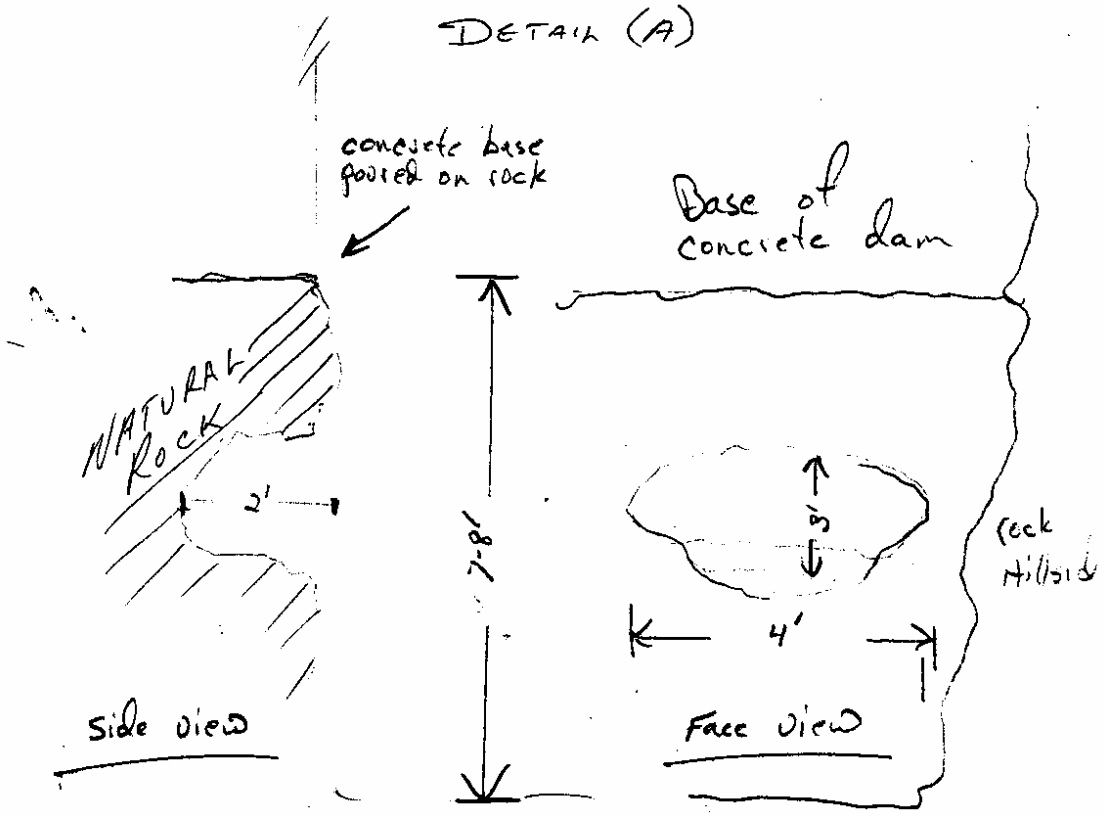
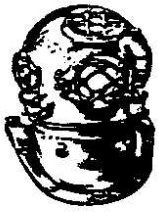
MILL POND DAM SPILLWAY 8 September 2000



Details of undercut area

appears to have broken out
No new broken or missing rock evident

SKETCH 2



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CONSTRUCTION - SALVAGE - EXPLOSIVES
CONSULTANT

WASHINGTON · IDAHO · MONTANA · OREGON · WYOMING

D. G. DARLOW - OWNER 8 September 2000
RES. PHONE: 467-5701

Mill Pond Dam
Spillway Apron
Diver-David Darlow

Photo's
#1 Looking Upstream over rock ledge.

#4 Looking over rock outcropping

#5 Trough area that extends from the top of the outcropping to the base of the rock

#7 Looking South at waterline to outcroppings that extend above spillway

#8 Looking North from same spot as #7

#9 View of North corner of the CRIB area in rocks

#10 Looking UP around rock toconcrete intersection.

#13 View of base of dam at South side.

#15 Old gate frame bent around 8' dia. rock.

#16 Typical rock bottom of river channel. River drops about 3 feet between the dam and a 8' rock that is about 30' downstream of the dam. River bottom consist of rounded rock 3-10 inches in diameter.

Other pictures were taken but lacked in detail.

Photo 1

Photo 4

Photo 5

Photo 7

Photo 8

Photo 9

Photo 10

Photo 15

Photo 16